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			EXAMINER	
			UMEZ ERONINI, LYNETTE T	
			ART UNIT	PAPER NUMBER
			1765	

DATE MAILED: 12/01/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/006,704

Applicant(s)

TRAPP, SHANE J.

Examiner

Lynette T. Umez-Eronini

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 30 October 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-76 is/are pending in the application.
- 4a) Of the above claim(s) 36-70 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 26-35 and 71-76 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.  
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

### Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_ 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### ***Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 26-31, 32-35, 73, 74, and 76 are rejected under 35 U.S.C. 102(b) as being anticipated by Hamrah et al. (EP 0 553961 A2).

Hamrah teaches a reactive ion etch process for etching oxide (insulative) layers by using a standard oxide etch chemistry that include  $\text{CHF}_3$ , Ar, and  $\text{CF}_4$  (page 2, lines 1-5, 16-18), adding a gaseous source of hydrogen radical, such as ammonia to the oxide RIE etching chemistries (page 2, lines 32-34), and supplying a selected reactive gas mixture including a gaseous source of hydrogen radicals and RF are supplied to the chamber to establish an etching plasma (page 2, lines 44-46). Example 3 shows a flow rate of  $\text{NH}_3$  as low as 4 and as high as 10 sccm along with the flow rates of  $\text{CHF}_3$  and  $\text{CF}_4$  (page 5, lines 36-53 and page 7, lines 26, 29, 35, and 44). The aforementioned reads on,

A composition suitable for use in etching an insulative layer formed over a substrate in a semiconductor device, said composition comprising:

a flowing plasma etchant mixture consisting essentially of at least one fluorocarbon and ammonia, wherein said ammonia has a flow rate that is from about 2 sccm to about 6 sccm, **in claim 26**;

wherein said fluorocarbon is at least one member selected from the group consisting of fluorocarbons, **as in claim 27**;

wherein said fluorocarbon is at least one member selected from the group consisting of  $C_4F_8$ ,  $C_4F_6$ ,  $C_5F_8$ ,  $CF_4$ ,  $C_2F_6$ ,  $CHF_3$ , and  $CH_2F_2$ , **in claim 28**; and

wherein said fluorocarbon is at least one member selected from the group consisting of  $CF_4$ ,  $CHF_3$ , and  $CH_2F_2$ , **in claim 29**;

wherein said fluorocarbon is at least two members selected from the group consisting of and is a combination of  $CF_4$ ,  $CHF_3$  and  $CH_2F_2$ , **in claim 30**; and

Hamrah teaches the flow rate of 30 sccm  $CHF_3$  and 7 sccm ammonia (page 9, lines 2-5), which reads on a flow ratio of 30:7 that encompasses the flow rate ratio of said fluorocarbon to said ammonia is not less than about 3:1, **in claim 33**; and said flow rate ratio is within the range of about 3:1 to about 20:1 and 4:1 to about 10:1, respectively **in claims 34 and 35**.

Since Hamrah uses the same etchants to etch an insulation layer as that of the claimed invention then, using Hamrah's etchants in the same manner as in the claimed invention would result wherein said is ineffective to remove side wall spacers of a gate formed over said substrate, **in claim 32**.

Hamrah also teaches, " . . . suitable ranges and optimum values for 5 inch silicon wafer for use of the invention with a preferred reaction chemistry:  $CHF_3$  flow ranges

from 10-100 sccm; CF<sub>4</sub> flow rate ranges from 3-20 sccm; Pressure, 5-500 mT; Temperature 0-20 C . . .” (page 4, lines 13); the flow rate of 30 sccm CHF<sub>3</sub> and 7 sccm ammonia (page 9, lines 2-5), and Example 3 that shows a flow rate of NH<sub>3</sub> as low as 4 and as high as 10 sccm (page 5, lines 36-53), which encompasses the operating parameter and etching parameters as specified in **claims 73, 74, and 76**.

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claim 31 and 75 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hamrah (EP '961 A2) as applied to claim 26 above, and further in view of Becker et al. (US 6,015,760).

Hamrah differs only in failing to teach wherein said fluorocarbon is at least two members selected from the group consisting of and is a combination of  $\text{CF}_4$ ,  $\text{CHF}_3$  and  $\text{CH}_2\text{F}_2$ , in claim 31.

Becker teaches anisotropic etching takes place primarily in the vertical direction so that feature widths substantially match the photoresist pattern widths (column 1, lines 40-43); and anisotropic etching is utilized when feature sizing after etching must be maintained within specific limits so as not to violate alignment tolerances or design rules (column 1, line 43-46); and selectively etching  $\text{SiO}_2$  layer with respect to a nitride layer by using a fluorinated chemical etchant system that comprises:  $\text{CF}_4$ ,  $\text{CHF}_3$  and a  $\text{CH}_2\text{F}_2$  additive material (column 4, lines 16-18) and in this way, the etching process provides for the formation of sidewalls in etched layers which have a substantially vertical profile (column 4, lines 29-31).

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claim invention to modify Hamrah by combining the etchants as taught by Becker for the purpose of meeting specific limits that would not violate alignment tolerances or design rules (Becker, column 1, lines 43-46).

Hamrah differs in failing to teach wherein said fluorocarbon is  $\text{CH}_2\text{F}_2$  with a flow rate of about 10 sccm to about 15 sccm, in claim 75.

Becker teaches, ". . . the chemical etchant composition including  $\text{CHF}_3$ ,  $\text{CF}_4$  and Ar, and an additive material comprising  $\text{CH}_2\text{F}_2$ , the exposed  $\text{SiO}_2$  . . . is selectively etched . . ." (column 4, lines 29-31).

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claim invention to modify Hamrah by combining the etchants as taught by Becker for the purpose of meeting specific limits that would not violate alignment tolerances or design rules (Becker, column 1, lines 43-46).

6. Claims 71 and 72 are rejected under 35 U.S.C. 103(a) as being unpatentable over Levinstein et al. (US 4,985,373) in view of Hamrah (EP '961 A2).

As pertaining to claims 71 and 72, Levinstein teaches, "A method of making an integrated circuit structure based on a silicon body . . ." (claim 1) and "other anisotropic reactive ion etchants of silicon dioxide can be used, such as a mixture of  $\text{CHF}_3$  and  $\text{NH}_3$ " (column 6, lines 35-37), which reads on,

A composition suitable for use in etching an insulative layer formed over a substrate in a semiconductor device, said composition comprising:

A flowing plasma etchant mixture consisting of at least one fluorocarbon and ammonia.

Levinstein differs in failing to specify an operating pressure of from about 30 to about 60 milliTorr, wherein the flow rate ratio of said at least one fluorocarbon to said ammonia is from about 2:1 to about 40:1, in claim 71.

Hamrah teaches, " . . . suitable ranges and optimum values for 5 inch silicon wafer for use of the invention with a preferred reaction chemistry: . . . Pressure, 5-500 mT" (page 4, lines 9); the flow rate of 30 sccm  $\text{CHF}_3$  and 7 sccm ammonia (page 9,

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lines 2-5), which reads on a flow ratio of 30:7 that encompasses an operating pressure of from about 30 to about 60 milliTorr and the flow rate ratio of said fluorocarbon to said ammonia from about 2:1 to about 40:1, **in claim 71**.

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of that claimed invention to modify Levinstein by varying the flow ratio of the etchant composition as taught by Hamrah since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Levinstein differs in failing to specify an operating temperature of from about -50°C to about 80°C, wherein said ammonia has a flow rate that is from about 2 sccm to about 6 sccm, **in claim 72**;

Hamrah teaches, "... suitable ranges and optimum values for 5 inch silicon wafer for use of the invention with a preferred reaction chemistry: ... Temperature 0-20 C ... " (page 4, lines 13); and Example 3 shows a flow rate of NH<sub>3</sub> as low as 4 and as high as 10 sccm (page 5, lines 36-53), which encompasses the operating temperature of from about -50°C to about 80°C and the flow rate of ammonia from about 2 sccm to about 6 sccm and which provides evidence that the flow rate ratio is a so-called "result effective variable."

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of that claimed invention to modify Levinstein by varying operating and etchant parameter as taught by Hamrah since it has been held



that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

***Response to Arguments***

7. Applicant's arguments with respect to claims 26-25 and 71-74 have been considered but are moot in view of the new ground(s) of rejection.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynette T. Umez-Eronini whose telephone number is 703-306-9074 and after December 10, 2003, the examiner may be reached at 571-272-1470. The examiner is normally unavailable on the First Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 703-305-2667. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

*Lynette T. Umez-Eronini*  
ltue

November 24, 2003